OLED for Automobile Applications

Dr. Thilo Reusch | Feb 2, 2016 | Raleigh, USA

Light is OSRAM

Agenda

OLED in AM applications

- Design as innovation driver
- OLED features

Technological challenges for OLED inAutomotive

- Increase robustness and reliability

Upcoming challenges

- Flexible OLEDs for Automotive

OSRAM OLED GmbH within OSRAM Family

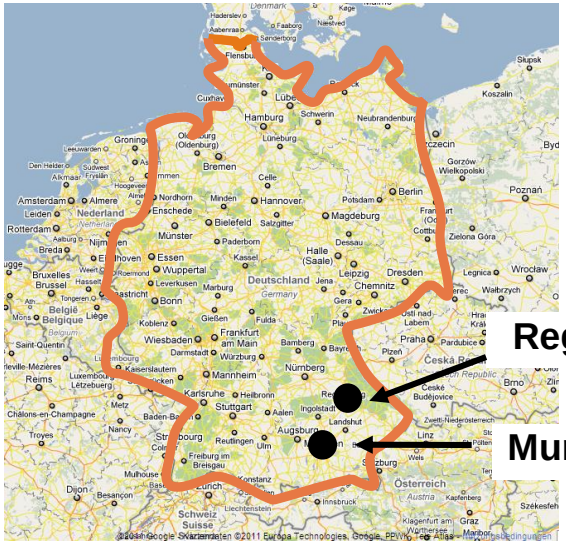
Owner: 100% subsidiary of OSRAM Opto Semiconductor GmbH

Management: CEO Dr. Marc Lünnemann
CFO Ricardo Rehm

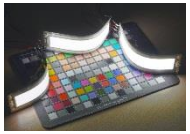
Reporting: Directly reporting to Automotive business segment of OSRAM Business unit Speciality Lighting

Location: Regensburg, Germany

Focus: OLED Components for automotive applications and general illumination



OLED @ OSRAM Track Record

	R&D	Production	Products & Applications
2005	▪ Launch of OLED lighting activity in Regensburg	▪ Pre-Pilot production launch	▪ World's first commercial OLED luminaire **"Early Future"** 
2009	▪ Efficiency record for lab sample with 62 lm/W (real white OLED)		▪ 1st Gen OLED products from series production ▪ World's first „long term" installation of 100 OLEDs at EXPO in Shanghai
2011	▪ World record for 2.5D OLEDs with 32 lm/W efficacy  ▪ Lab record 87 lm/W @ 4000K	▪Opening of OLED pilot line in Regensburg 	▪ Award winning luminaire "Airabesc"  
2012	▪ 1st Auto milestone: 1600 h LT70 @ 50°C ▪ Large area transparent OLED (116 cm²) production proven design 		▪ 2nd Gen OLED products from series production (40 lm/W, 2000 nits, 10 kh LT70) ▪ System expertise proven by dedicated connector and electronics solutions
2013	▪ 2nd Auto milestone: 3 kh LT70 @ 50°C 		▪ Award winning OLED module  
2014	▪ GI eng. samples from pilot line: 65 lm/W @ 3000 cd/m², 15 kh LT70  ▪ 3rd Auto milestone:3kh LT70 @ 85°C	▪ ISO9001 and ISO14001 certification	▪ Launch OLED Reading Light 
2015	▪ Auto: 4 kh LT70 @ 85°C (2000 nits) ▪ 1000 nits: 8000 hrs reached  ▪ GI: > 95 lm/W ▪ **>1700 patents in OLED**	▪ TS16949 Audit (Letter of conformity expected for October)	▪ BMW M4 "Iconic Lights" Showcar at CES

Different focus for different OLED application cases

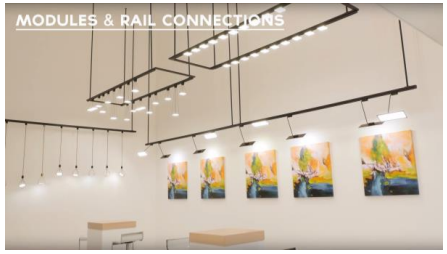
Automotive is going to be the first volume application

Special Applications	General Illumination	Automotive
		
• Specific to application	• Cost • Efficiency • Lifetime	• Design / Features • Reliability • Robustness • Cost

What is special about OLED?

Unique form factors offer design options and quality of light unmatched by any other light source.

Philips



LG

Astron Fiamm

OSRAM

Philips

Design

OSRAM

Konica Minolta

Acuity Duet SSL (LG panel)

OSRAM

Differentiator today: Segmentation

LED

optical system

Point light source

Reflector or lightguide structures shape light distribution

OLED

Surface emitter

No optical system neccessary

Additional styling feature OLED segmentation

Automotive Demonstrators: Unique features

Transparency

- Clear view without haze
- 3D and depth effects using transparency
- Adjustable emission ratio between front/back

Segmentation

in cooperation with AUTOMOTIVE LIGHTING

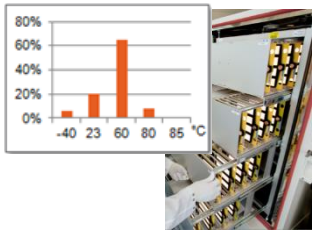
- Independently addressable segments with minimized gaps
- Individual dynamic scenarios
- 3D effects out of 2D by different brightness levels (shadowing)

Automotive Requirements

Reliability under harsh environmental conditions is key

High temperature operation +

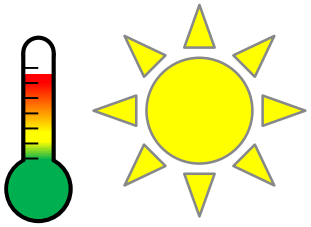
Lifetime at elevated temperatures (av. 50 °C)



- LT70 6kh / 8kh at 1200nits / 1000nits, over temperature mission profile up to ~85°C.

High temperature storage +

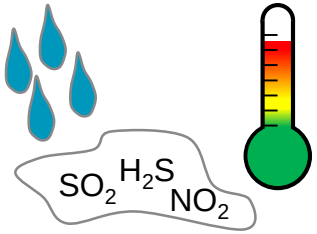
Storage at elevated temperatures (≥ 85 °C)



- >3.000h at 95°C (accelerated testing conditions)

Harsh environ-mental conditions +

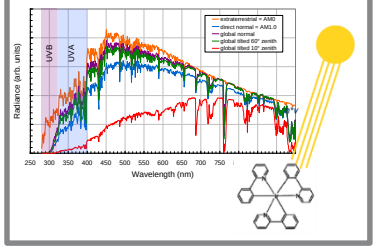
Storage at elevated humidity & temp., corrosive gases, etc.



- >10 years under de-fined environmental condition, tested by >2000h at 85°C/85%rH.

Sunlight exposure

Storage under sunlight (→ UV exposure)



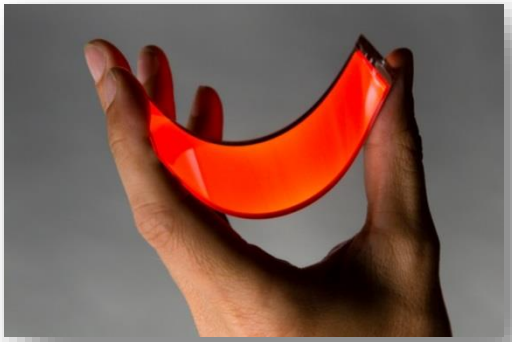
- OLED + RCL tested in sun tester >1000h.

short-term

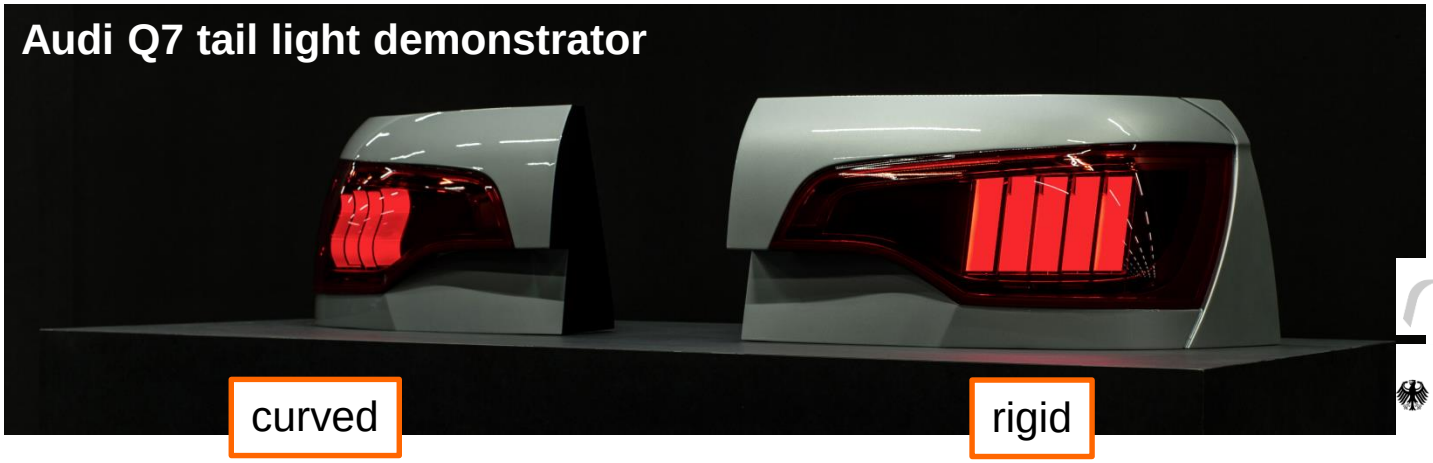
- Entry level requirements will be raised for follow-up projects

Flexible OLEDs: Features

Future differentiator: unique form factors offer design options unmatched by any other light source



- Curvature adjustable light sources
- Bendable light sheets: 2.5D out of planar
- Ultra-flat, light-weight



GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung

Flexible OLED taillight demonstrator

Flexible OLED – predevelopment in joint funded projects

Bundesministerium für Bildung und Forschung

Project partner:

- AUDI: OLED design and car integration and tests
- HELLA: electrical contact, mounting concept and integration into RCL incl. control
- OSRAM: OLED module and testing

Flexible OLED for General Illumination

Flexible luminaire demonstrators within funded project OLYMP

Special OLED mount and connector concept

- Flexible mount for front and backside emission.
- Rapid prototyping by 3D printing.
- Cascadable in arbitrary chain lengths
- Reverse voltage protection

To be presented by BJB at Light&Building 2016

Summary

OLED enables new design

Automotive Lighting is strongly design driven

- Innovation driver

Segmentation (today) and flexibility (tomorrow) are key differentiators

- Arbitrary and clearly defined light shapes in 2D and 3D.

Technology challenge: Robustness and reliabilty

Automotive applications can be a stepping stone for other application fields

Light is OSRAM.

Visit us:

www.osram-oled.com

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